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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/014,345	12/14/2001	Haruo Furuta	217208US2	1156

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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.  
1940 DUKE STREET  
ALEXANDRIA, VA 22314

EXAMINER

OWENS, DOUGLAS W

ART UNIT PAPER NUMBER

2811

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/014,345

Applicant(s)

FURUTA ET AL.

Examiner

Douglas W Owens

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-5, 7-11 and 13 is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☒ Claim(s) 6 and 12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Election/Restrictions***

1. In light of the petition filed on November 9, 2002, the restriction requirement mailed on September 9, 2002 has been withdrawn.

***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1 – 3 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation, "...a depth of said recessed portion being defined...according to a characteristic of variation in threshold voltage of either...transistor with respect to variation in depth of said recessed portion." The claim requires that the threshold voltage be constant at a depth of the recessed portion, yet defines that depth relative to a variation of in the threshold voltage. The scope of the claim cannot be understood because the subject matter being claimed is not clear.

The scope of claim 2 cannot be discerned since neither the maximum range of variation, nor the characteristic of variation has been defined.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 2 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by admitted prior art.

Regarding claims 1 and 4, admitted prior art teaches a semiconductor device

(Fig. 28) comprising:

an isolation film (2) in a surface of a semiconductor substrate (10);

first and second transistors (AR, BR) on first and second active regions defined by the isolation film;

the first transistor having a first gate insulating film (GX1) with a first thickness

the second transistor having a second gate insulating film (GX2) with a second thickness, wherein the first thickness is greater than the second thickness;

wherein the isolation film has a first and second recessed portion in an edge portion on the side of the active region, wherein the depth is defined as a depth at which the threshold voltage is constant according to a characteristic of variation in threshold voltage of the first or second transistor with respect to variation in depth.

Regarding claim 2, admitted prior art teaches a device, wherein the threshold voltage of one of the transistors is constant at a depth at which a range of variation in

the threshold voltage is 5 to 10 percent of a maximum range of variation according to the characteristic of the variation.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1 – 5 and 7 – 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US patent No. 6,417,037 to Feng in view of US patent No. 6,500,726 to Lee et al.

Regarding claims 1, 4 and 7 – 9, Feng teaches a semiconductor device (Fig. 6) comprising:

an isolation film (12) in a surface of a semiconductor substrate (10);

first and second transistors (24, 22) on first and second active regions defined by the isolation film;

the first transistor having a first gate insulating film (16) with a first thickness; and

the second transistor having a second gate insulating film (14) with a second thickness, wherein the first thickness is greater than the second thickness.

Feng does not teach a semiconductor device, wherein the isolation film has a first and second recessed portion in an edge portion on the side of the active region, wherein the depth is defined as a depth at which the threshold voltage is constant according to a characteristic of variation in threshold voltage of the first or second

transistor with respect to variation in depth. Lee et al. teaches a semiconductor device (Fig. 15), wherein the isolation film has a first and second recessed portion in an edge portion on the side of the active region, wherein the depth is defined as a depth at which the threshold voltage is constant according to a characteristic of variation in threshold voltage of the first or second transistor with respect to variation in depth and deepest part of the recessed portion, and is not less than 10 nm (Col. 4, lines 1 – 9). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Lee et al. into the device taught Feng, since it is desirable to decrease the degradation in the transistor characteristic (Lee et al., Col. 3, lines 5 – 12). It is also desirable to prevent the gate insulating film from being thin in the edge portion when it is formed (Col. 4, lines 47 – 51).

It would have also been obvious to provide the isolation film and recessed area around the active region since the purpose of the isolation film is to isolate the active area.

Regarding claim 2, neither Feng nor Lee et al. explicitly disclose a device, wherein the threshold voltage of one of the transistors is constant at a depth at which a range of variation in the threshold voltage is 5 to 10 percent of a maximum range of variation according to the characteristic of the variation. The proposed device of Feng and Lee et al. would have inherently had this feature since it is identical to the claimed invention.

Regarding claims 3 and 5, Feng does not teach a device, wherein a depth of the recessed portion is defined as a vertical height between a main surface of the first

active region and a deepest part of the recessed portion, and is not less than 10 nm.

Lee et al. teaches a device, wherein a depth of the recessed portion is defined as a vertical height between a main surface of the first active region and a deepest part of the recessed portion, and is not less than 10 nm (Col. 4, lines 1 – 9). It would have been obvious to incorporate the teaching of Lee et al. into the device taught by Feng for reasons discussed above.

Regarding claims 10, 11 and 13, Feng does not explicitly teach a first transistor that forms an I/O circuit and the second transistor forms an analog circuit. Feng teaches a device, wherein the first transistor is ideal for use in an I/O circuit and a second transistor that is ideal for use in an analog circuit since the first transistor has a thick gate oxide and the second transistor has a relatively thin gate oxide. It would have been obvious to use the device for the purpose it is designed.

***Allowable Subject Matter***

9. Claims 6 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not disclose a semiconductor device as discussed above, and further including an insulation film that has another recessed portion, wherein the additional recessed portion is shallower than the first recessed portion.


**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DWO  
March 23, 2003

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800